Bulletin I27141 rev. F 10/02

International
IOR Rectifier

IRK.91 SERIES

STANDARD DIODES

ADD-A-pak™ GEN V Power Modules

Features

- High Voltage
- Industrial Standard Package
- Thick Al metal die and double stick bonding
- Thick copper baseplate
- UL E78996 approved
- 3500V_{RMS} isolating voltage

Benefits

- Up to 1600V
- Full compatible TO-240AA
- High Surge capability
- Easy Mounting on heatsink
- Al_20_3 DBC insulator
- Heatsink grounded

100 A

Mechanical Description

The Generation V of Add-A-pak module combine the excellent thermal performance obtained by the usage of Direct Bonded Copper substrate with superior mechanical ruggedness, thanks to the insertion of a solid Copper baseplate at the bottom side of the device. The Cu baseplate allow an easier mounting on the majority of heatsink with increased tolerance of surface roughness and improve thermal spread.
The Generation V of AAP module is manufactured without hard mold, eliminating in this way any possible direct stress on the leads.

The electrical terminals are secured against axial pull-out: they are fixed to the module housing via a click-stop feature already tested and proved as reliable on other IR modules.

Electrical Description

These modules are intended for general purpose high voltage applications such as high voltage regulated power supplies, lighting circuits, temperature and motor speed control circuits, UPS and battery charger.

Major Ratings and Characteristics

Parameters		IRK.91	Units
$I_{F(AV)}$		100	A
	@ T_C	100	°C
$I_{F(RMS)}$		157	A
I_{FSM}	@ 50Hz	2020	A
	@ 60Hz	2110	A
I^2t	@ 50Hz	20.43	KA^2s
	@ 60Hz	18.65	KA^2s
$I^2\sqrt{t}$		204.3	$KA^2\sqrt{s}$
V_{RRM} range		400 to 1600	V
T_J		- 40 to 150	°C
T_{STG}		- 40 to150	°C

ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number	Voltage Code	V_{RRM} , maximum repetitive peak reverse voltage V	V_{RSM} , maximum non-repetitive peak rev. voltage V	I_{RRM} max. @ T_J = 150°C mA
IRK.91	04	400	500	10
	06	600	700	
	08	800	900	
	10	1000	1100	
	12	1200	1300	
	14	1400	1500	
	16	1600	1700	

Forward Conduction

	Parameter	IRK.91	Units	Conditions		
$I_{F(AV)}$	Max. average forward current	100	A	180° conduction, half sine wave		
	@ Case temperature	100	°C			
$I_{F(AV)}$	Max. average forward current	90	A	180° conduction, half sine wave		
	@ Case temperature	107	°C			
$I_{F(RMS)}$	Max. RMS forward current	157	A	DC @ 90°C case temperarure		
I_{FSM}	Max. peak, one-cycle forward, non-repetitive surge current	2020	A	t = 10ms	No voltage reapplied	Sinusoidal half wave, Initial $T_J = T_J$ max.
		2110		t = 8.3ms		
		1700		t = 10ms	100% V_{RRM} reapplied	
		1780		t = 8.3ms		
I^2t	Maximum I^2t for fusing	20.43	KA^2s	t = 10ms	No voltage reapplied	
		18.65		t = 8.3ms		
		14.45		t = 10ms	100% V_{RRM} reapplied	
		13.19		t = 8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\ddot{O}t$ for fusing	204.3	$KA^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied		
$V_{F(TO)1}$	Low level value of threshold voltage	0.79	V	$(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)})$, $T_J = T_J$ max.		
$V_{F(TO)2}$	High level value of threshold voltage	0.87		$(I > \pi \times I_{F(AV)})$, $T_J = T_J$ max.		
r_{f1}	Low level value of forward slope resistance	1.78	mΩ	$(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)})$, $T_J = T_J$ max.		
r_{f2}	High level value of forward slope resistance	1.57		$(I > \pi \times I_{F(AV)})$, $T_J = T_J$ max.		
V_{FM}	Max. forward voltage drop	1.45	V	$I_{FM} = p \times I_{F(AV)}$, T_J = 25°C, t_p = 400µs square wave		

Blocking

	Parameter	IRK.91	Units	Conditions
I_{RRM}	Max. peak reverse leakage current	10	mA	T_J = 150°C
V_{INS}	RMS isolation voltage	3500 (1 sec)	V	50 Hz, circuit to base, all terminals shorted

Thermal and Mechanical Specifications

	Parameter		IRK.91	Units	Conditions
T_J	Max. junction operating temperature range		-40 to 150	°C	
T_{stg}	Storage temperature range		-40 to 150		
R_{thJC}	Max. thermal resistance, junction to case		0.35	K/W	Per junction, DC operation
R_{thCS}	Typical thermal resistance, case to heatsink		0.1		Mounting surface flat, smooth and greased
T	Mounting torque ±10%	to heatsink	5	Nm	A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow for the spread of the compound
		busbar	4		
wt	Approximate weight		110 (4)	g (oz)	
	Case style		TO-240AA	JEDEC	

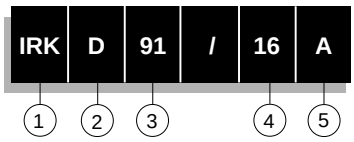
ΔR Conduction (per Junction)

(The following table shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC)

Devices	Sine half wave conduction					Rect. wave conduction					Units
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
IRK.91	0.052	0.064	0.082	0.112	0.164	0.043	0.069	0.088	0.115	0.165	°C/W

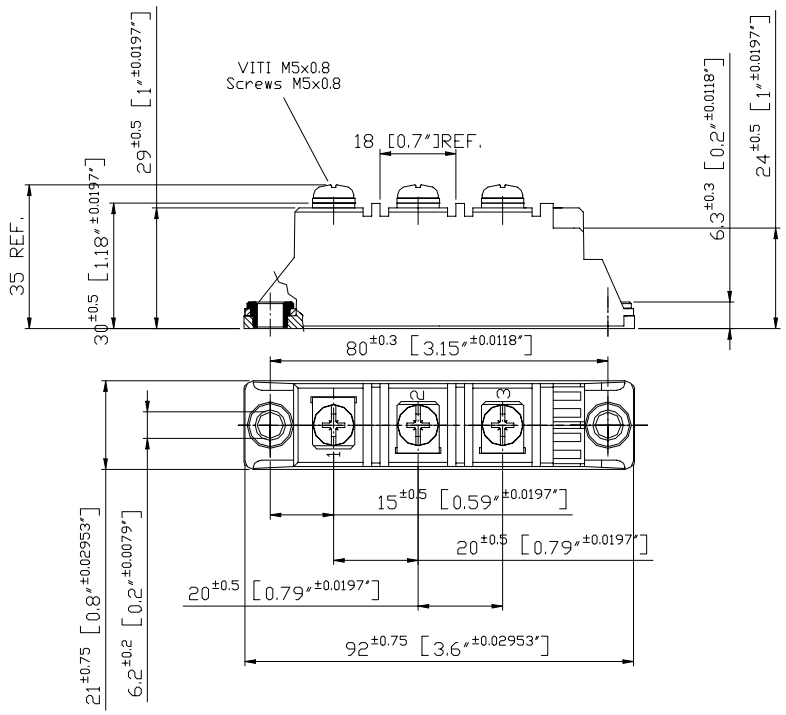
Ordering Information Table

Device Code



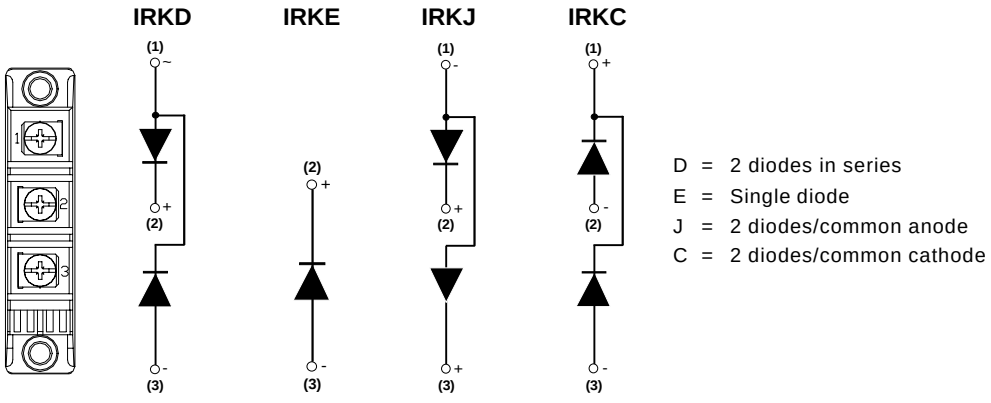
1 - Module type
2 - Circuit configuration (See Circuit Configuration Table)
3 - Current code
4 - Voltage code (See Voltage Ratings Table)
5 - A: Gen V

Outline Table



Dimensions are in millimeters and [inches]

Circuit Configuration Table



D = 2 diodes in series
E = Single diode
J = 2 diodes/common anode
C = 2 diodes/common cathode

NOTE: To order the Optional Hardware see Bulletin I27900

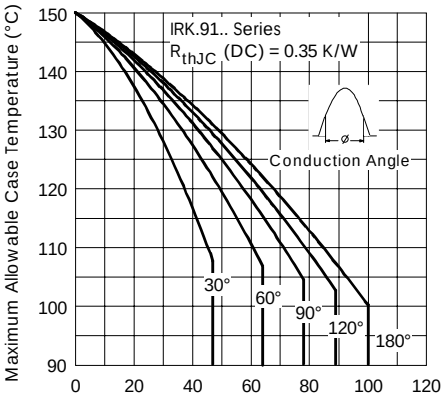


Fig. 1 - Current Ratings Characteristics

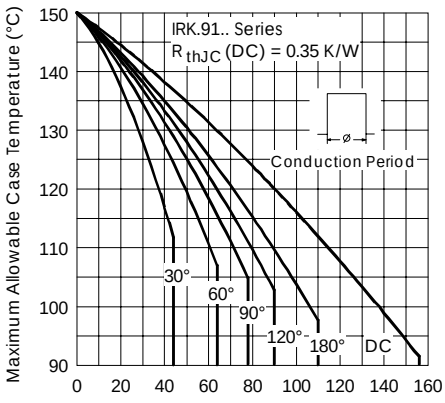


Fig. 2 - Current Ratings Characteristics

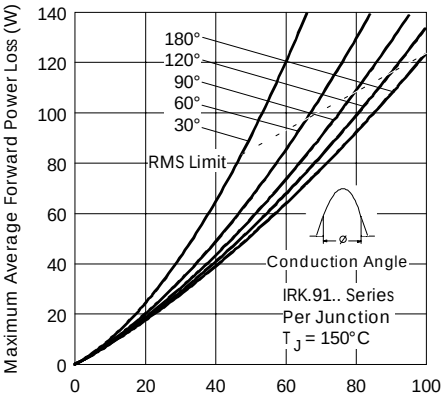


Fig. 3 - Forward Power Loss Characteristics

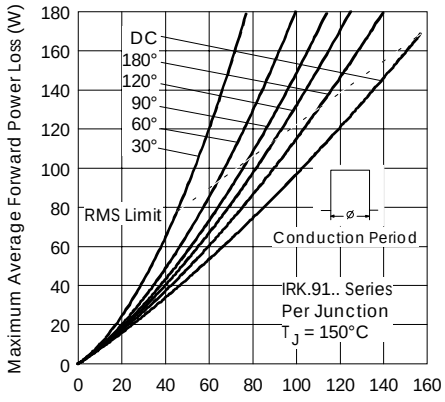


Fig. 4 - Forward Power Loss Characteristics

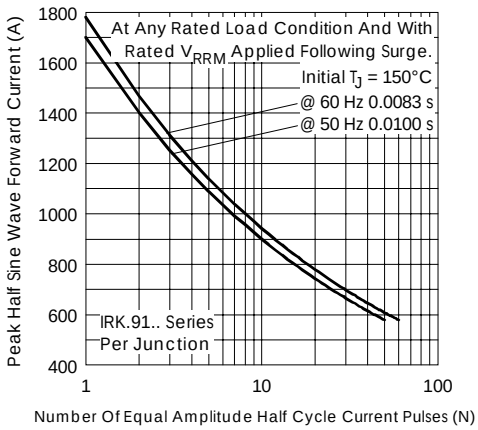


Fig. 5 - Maximum Non-Repetitive Surge Current

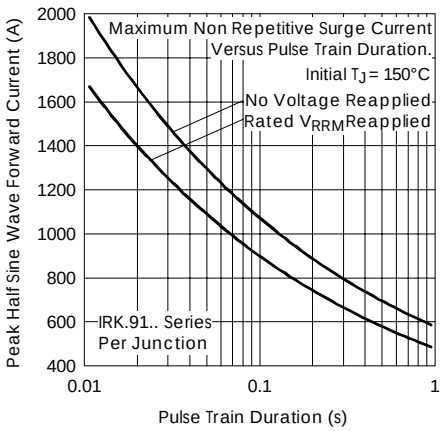


Fig. 6 - Maximum Non-Repetitive Surge Current

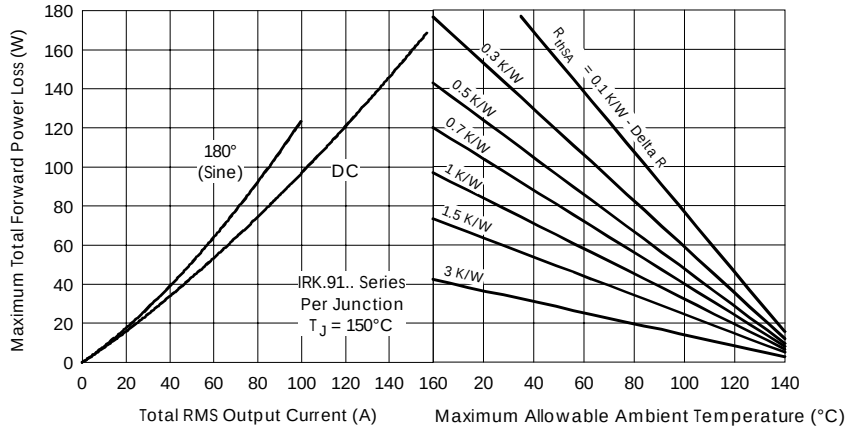


Fig. 7 - Forward Power Loss Characteristics

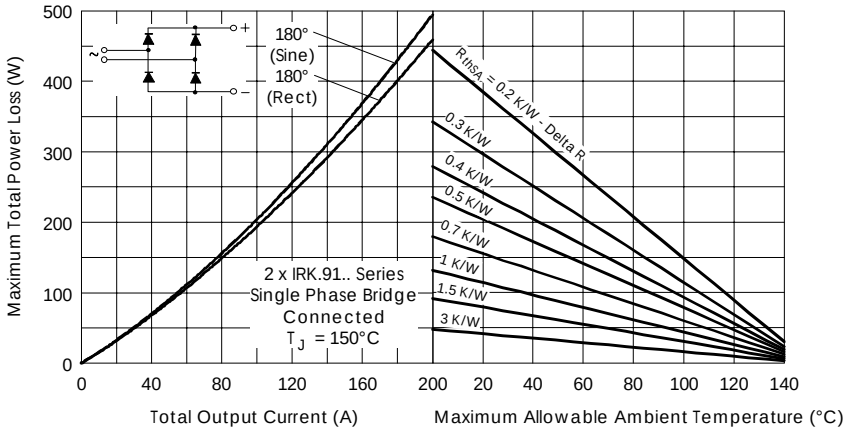


Fig. 8 - Forward Power Loss Characteristics

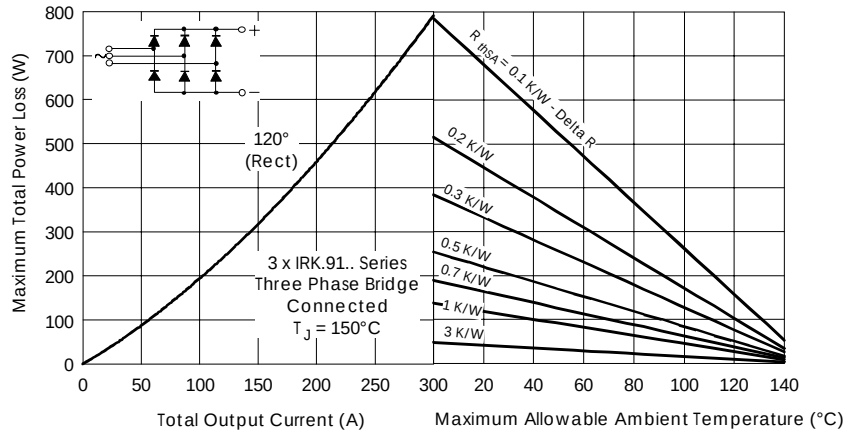


Fig. 9 - Forward Power Loss Characteristics

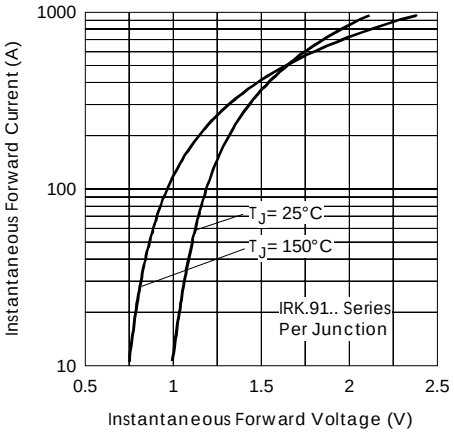


Fig. 10 - Forward Voltage Drop Characteristics

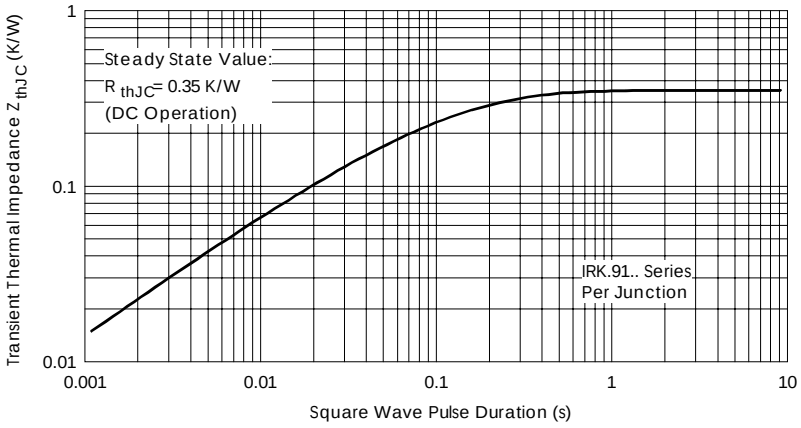


Fig. 11 - Thermal Impedance Z_{thJC} Characteristic

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